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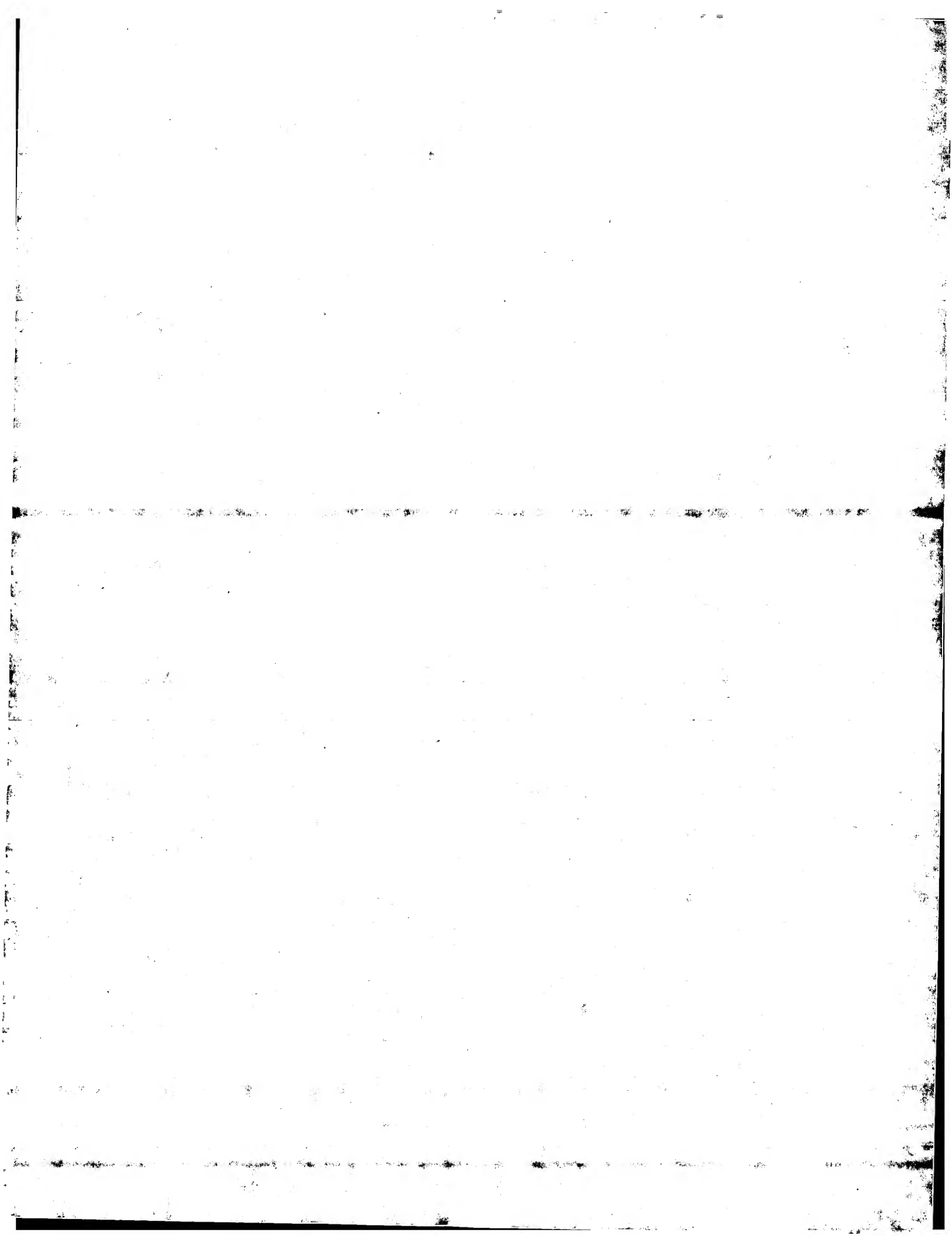
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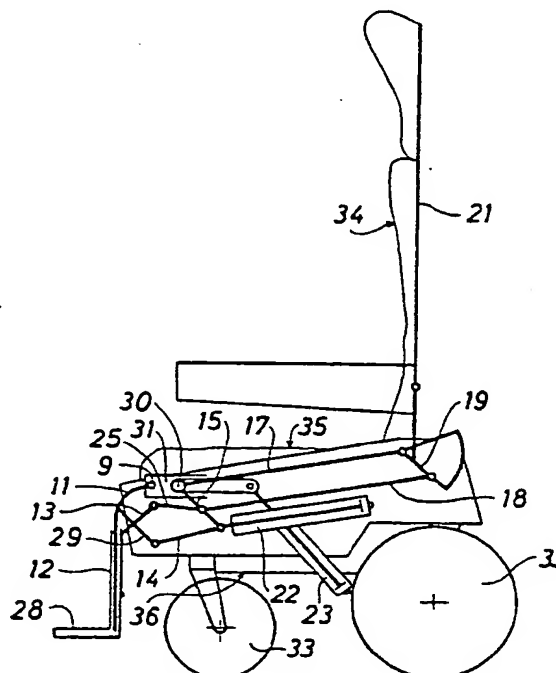
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: WHEEL CHAIR

(57) Abstract

A wheel chair equipped with a chassis (36) provided with a frame with leg supporting means (11, 12), a seat (35), and a back (34), and whereby a common rod system (15, 17, 18, 19, 14, 25) is connected to said chassis (36) and said frame. This rod system may by means of a moving unit (22, 23) move the seat and the back from their position in usual sitting position towards an upright position in such a manner that the seat, the back, and the leg supporting means are arranged above each other, said seat performing a turn about its front edge during the raising movement and said back maintaining its upright position at the same time as the leg supporting means provided with foot-rests (28) in the form of plates are moved downwards to steady against the surface to be traversed by the wheel chair. The rod system (15, 17, 18, 19, 14, 25) including relatively few rods is adapted so as to maintain the back in a substantially upright position and simultaneously extend the leg supporting means during the movement of the seat (35) and the back (34) towards the upright position, whereby the distance of the foot-rests (28) in the form of plates of said leg supporting means to the traversing surface of the wheel chair is reduced, optionally reduced to zero. However, the rod system is furthermore adapted so as to move the seat, the back, and the leg supporting means from the sitting position into the lying position, i.e. into a substantially horizontal plane, in which the leg supporting means are extended.



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Technical Field

The invention relates to a wheel chair of the type in which a chassis including the wheel means necessary for the movement is provided with a frame with leg supporting means, a seat, and a back, and whereby a rod system connected to said chassis and said frame is adapted to move the seat and the back from the usual sitting position towards an upright position by means of a movable unit mounted on the chassis in such a manner that the seat, the back, and the leg supporting means are arranged above each other, said seat performing a turn about its front edge during the raising movement and said back maintaining its upright position at the same time as the leg supporting means provided with foot-rests are moved downwards to steady against the surface to be traversed by the wheel chair.

Background Art

Wheel chairs of the above type are known, which are capable of raising a handicapped person to an upright position by operating an activator, e.g. an electric contact. In this manner the handicapped person obtains a longer reach and is able to reach objects situated within the height reachable by non-handicapped persons. This is of great importance to the handicapped person since he is thereby able to function better in usual home and working environments.

In order to increase the range of mobility of the handicapped person and to enable him to cope with the usual problems which he normally encounters in his home or place of employment, the wheel chair must - in addition to means for raising the user - comprise such possibilities of adjusting the inclination of the back as well as the leg supporting means that the handicapped person himself can easily perform said adjustment by operating an appropriate activator, e.g. an electric contact. By means of this contact he can



easily adjust the back and the leg supporting means to pleasant resting positions, in an infinitely variable manner from normal sitting position to completely extended resting position whereby the leg supporting means, the seat, and the back form a horizontal couch of a length permitting even a tall user to lie at full length thereon. Furthermore, the user must be able to adjust the seat height of the wheel chair in the working situation by means of one or more appropriate activators, e.g. electric contacts, from a starting height permitting passage beneath normal tables with frame portions, to a sitting height comfortable for even high desks. A correct height and support in any position is obtained both for the leg supporting means with their foot-rests as well as for the back, arm rests being mounted on said back. The user can, if desired, turn these foot-rests away to obtain a greater range of mobility while working. Furthermore, the user who can walk a little must be able to get out and into the wheel chair, e.g. in toilets, both when the seat is in normal sitting position as well as when it is in upright position and the user has risen. It is particularly advantageous to be able to level the wheel chair in resting position so that the user can adjust the couch of the wheel chair when the arm rests have been turned away in such a manner that the wheel chair flushes with his bed, thus permitting some users to move from the wheel chair into their beds by themselves.

Disclosure of Invention

The object of the invention is to provide a wheel chair of the above type, which can perform all the aforesaid functions at the same time as it is very simply constructed, said functions being performed by a simple rod system.

The rod system according to the invention is characterised in that the rod system including relatively few rods is adapted partly to maintain the back in a substantially up-

right position and simultaneously extend the leg supporting means during the movement of the seat and the back towards the upright position, whereby the distance of the foot-rests of said leg supporting means to the traversing surface of the wheel chair is reduced, optionally reduced to zero, and partly to move the seat, the back, and the leg supporting means from the sitting position into the lying position in a substantially horizontal plane in which said leg supporting means are extended, and that the movable unit is formed by at least two moving units, the first moving unit being capable of moving the parts connected to the rod system between the sitting and the upright position, whereas the second moving unit is capable of moving said parts between the sitting and the lying position. In addition to the usual sitting function, this wheel chair may be a great help to the handicapped person in many situations. Thus the wheel chair may raise the handicapped person into an upright position in such a manner that the feet of the standing person is levelled with the surface traversed by the chair. In this manner the invalid is considerably facilitated in getting out of the chair on his own, since persons walking with difficulty sense their handicap very clearly in connection with stairs and steps.

Furthermore, the wheel chair may be adjusted to a lying position, in which the handicapped person can rest as in a bed as well as move from the wheel chair into a bed and vice versa in an easier manner than previously. At the same time as the position of the wheel chair is altered from sitting position to lying position the leg supporting means are extended, which is a great advantage for the user since it is thereby avoided that the user is pushed upwards by the leg supporting means when the wheel chair is moved from sitting position to lying position. This upward pushing is due to the fact that the leg supporting means and the legs of the user turn about their respective point.



A particularly simple and inexpensive embodiment of the wheel chair according to the invention is characterised in that the rod system comprises at least one device shaped as a parallelogram and including four arms mutually connected by means of hinges or joints, whereby the third arm substantially parallel to the first arm is connected to the back and the first arm is connected to the leg supporting means, whereas the second or the fourth arm substantially parallel is fixedly connected to the seat and optionally forms part of the frame supporting the seat, and that the device shaped as a parallelogram is rotatably secured to the chassis through a first hinge means, the axis of rotation of which coincides with the axis of rotation of the hinge between the first and the second arm, and that the first moving unit is connected partly to the chassis and partly - at least indirectly - to the first arm so as at activation to be capable of turning the first arm about the axis of rotation of the first hinge means, and that the second moving unit is connected partly to the chassis and partly - at least indirectly - to the second arm so as at activation to be capable of turning the second arm about the axis of rotation of the first hinge means. As a result a very simple construction is obtained permitting the wheel chair to be movable to lying position, sitting position, and upright position and be fixed in these positions as well as in any intermediate position.

A particularly advantageous embodiment of the wheel chair according to the invention is characterised in that a third moving unit is coupled between the first hinge means and the chassis, said third moving unit at activation being capable of moving the first hinge means in vertical direction relative to the chassis whereby adjustment of height is permitted of the seat height in the sitting position and furthermore of the lying level. As a result the user can

adjust the seat height of the wheel chair by himself, which is very advantageous and useful when the user is working at tables of different heights, and which furthermore is a great help when the user wishes to move from the wheel chair into a bed and vice versa. This movement is essentially facilitated for the user when the parts of the wheel chair are moved to lying position and are of the same height as the bed.

According to the invention it is an advantage that the wheel chair is characterised in that the third moving unit mounted on the chassis of the wheel chair is provided with a pressure foot or a pressure roller usually raised a suitable height from the surface traversed by the chair, and which at activation of the moving unit may be pressed against said surface and thereby raise the front wheel of the wheel chair from said surface and simultaneously involve a higher location of the axis of rotation, said chassis being supported by the backward tilting of the rear wheels. Beyond an adjustment of height of the seat of the wheel chair this embodiment permits the wheel chair to pass small obstacles such as doorsteps, kerbs and the like without assistance. This is effected by the user driving the pressure leg provided with a pressure roller over the obstacle. Subsequently, the user lowers the pressure leg to such an extent that the front wheels of the chair - which are normally fork wheels having a diameter smaller than that of the pulling rear wheels - are raised so that said front wheels clear the obstacle when the chair is driven forwards on the pressure roller and the rear wheels.

According to the invention the wheel chair may furthermore be characterised in that the second or the fourth arm at the joint with the first arm is provided with a lengthening part, and that the leg supporting means comprise an upper leg supporting part connected to the first arm and a lower leg supporting part displaceable relative to said upper part, and



that the lower leg supporting part is connected to the lengthening part by means of a hinged lengthening arm. As a result a simple extending of the leg supporting means is obtained in the lying position and in upright position relative to their length in the sitting position.

According to the invention the wheel chair may be characterised in that the first arm is connected to the leg supporting means through a hinged connecting arm, and that the leg supporting means are connected to the chassis through a second hinge means constantly spaced from the first hinge means, the axis of rotation of said second hinge means being parallel to and arranged substantially in the same height as and in front of the axis of rotation of the first hinge means. As a result a greater stability of the wheel chair in the upright position is obtained as well as the user is not pushed out of the chair when it is moved to the upright position. Wheel chairs of this type easily become unstable in the upright position since the centre of gravity is displaced beyond the surface traversed by the chair. The construction of the present chair reduces this instability, although the seat, the back, and the leg supporting means are quite upright since the seat and the back in this position are moved a short distance backwards relative to the surface of the leg supporting means. Thereby the user leans backwards against a vertical surface, which prevents the wheel chair from tilting forwards. If desired, the wheel chair may in a manner known per se be provided with safety belts about the loin and beneath the knees of the user. This embodiment furthermore ensures that the user is not pushed out of the chair when moving to the upright position as a consequence of the low pressure on the springs or foam insertions of the seat.

Moreover the wheel chair may be characterised in that the end of the leg supporting means connected to the second hinge means is provided with a bend or a fold, the concave

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portion of which opposing the chassis. This embodiment permits a further backward displacement of the centre of gravity of the wheel chair in the upright position and thereby the stability in this position is increased. Furthermore, this embodiment permits the leg supporting means to level with the seat in the lying position, even when the seat is provided with a stuffing.

According to the invention it is particularly simple when a frame part in the back is connected to the third arm, which ensures the movements of the back in a simple manner.

In order to provide a particularly sturdy and stable wheel chair the rod system may according to the invention be formed by two devices shaped as parallelograms and arranged along each side of the seat.

It is according to the invention preferred that the moving units are hydraulic, pneumatic, mechanical or electric or combinations thereof.

According to the invention it is furthermore an advantage that the frame portion in the back is provided with pivoted arm rest means capable of being arranged in the same plane as the back. As a result it is easy to roll out of the wheel chair adjusted to the lying position and into a bed.

Brief Description of Drawings

The invention will be described below with reference to the accompanying drawings, in which

Fig. 1 is an isometric view of an embodiment of the wheel chair according to the invention, the rod system being especially clearly illustrated,

Fig. 2 is a diagrammatic, side view of the rod system and

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the remaining portion of the wheel chair adjusted to the sitting position,

Fig. 3 corresponds to Fig. 2, the wheel chair, however, being adjusted to the lying position, and

5 Fig. 4 corresponds to Fig. 2, the wheel chair, however, being adjusted to the upright position.

Best Mode for Carrying Out the Invention

10 The wheel chair illustrated in Figs. 1 to 4 is equipped with a chassis 36 provided with driving wheels 33, a chair frame including an adjustable seat 35, a back 34, and leg supporting means 11, 12. A rod system is connected to the chair frame and the chassis 36, and by means of a movable unit this rod system can move the seat, the back, and the leg supporting means to the upright, the sitting, and the
15 lying position.

The rod system illustrated comprises two devices shaped as a parallelogram and each including four arms 15, 15', 17, 17', 19, 19', 18, 18' mutually connected by means of hinges 1, 1', 2, 2', 3, 3', 4, 4'. At the hinge 1, 1' between the
20 first 15, 15' and the second arm 17, 17' of the device shaped as a parallelogram, both devices shaped as a parallelogram are connected to the first hinge means 30, 30' in turn connected to the chassis. The arms 17, 17', 18, 18' and 15, 15', 19, 19', respectively, of the devices shaped
25 as parallelograms are two and two of equal length and parallel. The devices shaped as parallelograms are thus suspended in the first hinge means 30, 30'. A first moving unit 22 is connected to the first arm 15' through a hinge 5', and a second moving unit 23 is connected to the second arm
30 17, 17' of the devices shaped as parallelograms by means of a pivot rod 26 including a boom 27. The third arm 19, 19' of the devices shaped as parallelograms is rigidly connected to

a frame portion 21 in the back, arm rest means 20 being secured to said back by means of hinges 10, 10'. The leg supporting means comprise an upper leg supporting part 11, 11' and a lower leg supporting part 12, 12' displaceable relative to said upper leg supporting part. The upper leg supporting part 11, 11' comprises a boom 29, 29'. Foot-rests 28, 28' in the form of plates are provided on the lower leg supporting part. The boom 29, 29' is connected to the first arm 15, 15' of the device shaped as a parallelogram by means of a connecting arm 14, 14'. The leg supporting means including their upper leg supporting part 11, 11' provided with a bend or a fold, the concave portion of which opposes the chassis, are connected to the chassis by means of a second hinge means 9, 9', whose axis of rotation extend parallel to the axis of rotation 16 of the first hinge means. Both the first 30, 30' and the second 9, 9' hinge means are provided in a hinge plate 31, 31'. The boom 29, 29' of the first leg supporting part 11, 11' is connected to the first arm 15, 15' of the device shaped as a parallelogram by means of the connecting arm 14, 14' of the hinges 6, 6', 5, 5'. The fourth arm 18, 18' of the device shaped as a parallelogram is at the hinge 3, 3' connecting it to the first arm 15, 15' provided with a lengthening part 25, the free end of which is connected to the lower displaceable leg supporting parts 12, 12' of the leg supporting means 7, 7', a lengthening arm 13, 13', and a hinge 8, 8'. The two hinge plates 31, 31' are rigidly interconnected by means of a partly indicated connecting portion 32. The hinge means 9, 9', 30, 30' and consequently the hinge plates 31, 31' and the connecting portion 32 are connected to the chassis by means of a third moving unit 24.

The wheel chair functions as follows:

If the wheel chair illustrated in Fig. 2, i.e. in the sitting position, is to be moved to the lying position, the first moving unit 22 is activated. The piston of this mo-



ving unit then moves outwards and turns the first arm 15, 15' of the device shaped as a parallelogram about the axis 16. The piston of the second moving unit 23 is simultaneously secured, i.e. that the second arm 17, 17' of the two devices shaped as parallelograms is secured. The devices shaped as parallelograms ensure that the third arm 19, 19' is turned and maintained parallel to the first arm 15, 15', and the fourth arm 18, 18' is parallelly displaced and maintained parallel to the second arm 17, 17'. At his movement the back of the wheel chair is moved to a horizontal position as illustrated in Fig. 3. The leg supporting means, the upper leg supporting part 11, 11' of which is connected to the first arm 15, 15' by means of a connecting arm 14, 14', is also moved to a horizontal position as illustrated in Fig. 3. By activating the first moving unit 22, the fourth arm 18, 18' is parallelly displaced to the left in such a manner that this lengthening part 25, 25' displaces the lower leg supporting part 12, 12' relative to the upper leg supporting part 11, 11' by means of the lengthening arm 13, 13', whereby the entire length of the leg supporting means is extended. The connection between the upper leg supporting part 11, 11' and the lower leg supporting part 12, 12' may, cf. Fig. 1, preferably be shaped as a telescope.

If the wheel chair instead is to be moved from the sitting position to the upright position, cf. Fig. 4, the second moving unit 23 is now actuated, whereas the first moving unit is secured. When the piston of the second moving unit 23 is moved outwards, its pressure effect is transferred to the pivot rod 26 rigidly connected to the second arm 17, 17', by means of the boom 27. Thereby this moving rod turns about the axis 16. The construction of the devices shaped as parallelograms ensures that the fourth arm 18, 18' is turned and maintained parallel to the second arm 17, 17'. The first 15, 15' and the third arm 19, 19' are maintained in their starting positions, thus providing the position of the wheel

chair illustrated in Fig. 4. All the time the back and the leg supporting means are vertical at the movement from the position illustrated in Fig. 2 to the position illustrated in Fig. 4. By turning the second 17, 17' and the fourth 18, 18' arm, the free end of the lengthening part 25, 25' of the fourth arm 18, 18' is turned, said movement being transferred to the lower leg supporting part 12, 12' by means of the lengthening arm 13, 13'. The entire length of the leg supporting means is thereby increased in such a manner that the foot-rests 28, 28' in the form of plates are carried to the surface traversed by the chair. Without descending a step, the user may now move away from the wheel chair.

Assuming the position illustrated in Fig. 2 of the first moving unit 22 and the second moving unit 23, and it is now desired to adjust the height of the seat, the third moving unit 24 is activated. Thereby the hinge plate 31, 31' and the first 30, 30' and the second hinge means 9, 9' are moved vertically upwards. This movement turn all four arms of the devices shaped as parallelograms, even when the piston of the first moving unit 22 and of the second moving unit 23 is secured. In order to adjust the lying position of the wheel chair, thus providing a horizontal surface, the user must activate the first and the second moving unit successively in order to move their pistons further outwards. The resulting position form a surface parallel to the surface illustrated in Fig. 3, but parallelly displaced upwards in vertical direction.

Claims

1. A wheel chair of the type in which a chassis (36) including the wheel means (33) necessary for the movement is provided with a frame with leg supporting means (11, 11', 12, 12'), a seat (35), and a back (34), and whereby a rod system (15, 15', 17, 17', 18, 18', 19, 19', 14, 14', 25, 25') connected to said chassis (36) and said frame (34, 35, 11, 11', 12, 12', and possibly 17, 17') is adapted to move the seat and the back from the usual sitting position towards an upright position by means of a movable unit (22, 23, 24) mounted on the chassis in such a manner that the seat, the back, and the leg supporting means are arranged above each other, said seat performing a turn about its front edge during the raising movement and said back maintaining its upright position at the same time as the leg supporting means provided with foot-rests (28, 28') are moved downwards to steady against the surface to be traversed by the wheel chair, c h a r a c t e r i s e d in that the rod system (15, 15', 17, 17', 18, 18', 19, 19', 14, 14', 25, 25') including relatively few rods is adapted partly to maintain the back in a substantially upright position and simultaneously extend the leg supporting means during the movement of the seat (35) and the back (34) towards the upright position (Fig. 4), whereby the distance of the foot-rests (28) of said leg supporting means to the traversing surface of the wheel chair is reduced, optionally reduced to zero, and partly to move the seat, the back, and the leg supporting means from the sitting position into the lying position (Fig. 3) in a substantially horizontal plane in which said leg supporting means are extended, and that the movable unit is formed by at least two moving units (22, 23), the first moving unit being capable of moving the parts connected to the rod system between the sitting and the upright position, whereas the second moving unit is capable of moving said parts between the sitting and the lying position.

2. A wheel chair as claimed in claim 1, c h a r a c -
t e r i s e d in that the rod system comprises at least
one device shaped as a parallelogram and including four
arms (15, 15', 17, 17', 19, 19', 18, 18') mutually connec-
5 ted by means of hinges or joints (1, 1', 2, 2', 3, 3', 4,
4'), whereby the third arm (19, 19') substantially parallel
to the first arm (15, 15') is connected to the back and the
first arm (15, 15') is connected to the leg supporting
means, whereas the second (17, 17') or the fourth (18, 18')
10 arm substantially parallel is fixedly connected to the seat
and optionally forms part of the frame supporting the seat,
and that the device shaped as a parallelogram is rotatably
secured to the chassis (36) through a first hinge means (30,
30'), the axis of rotation (16) of which coincides with the
15 axis of rotation of the hinge (1, 1') between the first (15,
15') and the second arm (17, 17'), and that the first moving
unit (22) is connected partly to the chassis and partly - at
least indirectly - to the first arm (15, 15') so as at acti-
vation to be capable of turning the first arm (15, 15')
20 about the axis of rotation (16) of the first hinge means (30,
30'), and that the second moving unit (23) is connected
partly to the chassis and partly - at least indirectly - to
the second arm (17, 17') so as at activation to be capable
of turning the second arm (17, 17') about the axis of rota-
25 tion (16) of the first hinge means (30, 30').

3. A wheel chair as claimed in claim 1 or 2, c h a r a c -
t e r i s e d in that a third moving unit (24) is coupled
between the first hinge means (30, 30') and the chassis,
said third moving unit at activation being capable of moving
30 the first hinge means (30, 30') in vertical direction rela-
tive to the chassis whereby adjustment of height is permit-
ted of the seat height in the sitting position and further-
more of the lying level.

4. A wheel chair as claimed in one or more of the preceding
35 claims, c h a r a c t e r i s e d in that the third moving

unit (24) mounted on the chassis of the wheel chair is provided with a pressure foot or a pressure roller usually raised a suitable height from the surface traversed by the chair, and which at activation of the moving unit (24) may be pressed against said surface and thereby raise the front wheel of the wheel chair from said surface and simultaneously involve a higher location of the axis of rotation (16).

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5. A wheel chair as claimed in one or more of the preceding claims, characterised in that the second (17, 17') or the fourth (18, 18') arm at the joint with the first arm (15, 15') is provided with a lengthening part (25), and that the leg supporting means comprise an upper leg supporting part (11, 11') connected to the first arm (15, 15') and a lower leg supporting part (12, 12') displaceable relative to said upper part, and that the lower leg supporting part (12, 12') is connected to the lengthening part (25) by means of a hinged (7, 7', 8, 8') lengthening arm (13, 13').

20
25
6. A wheel chair as claimed in one or more of the preceding claims 1 to 5, characterised in that the first arm (15, 15') is connected to the leg supporting means through a hinged (5, 5', 6, 6') connecting arm (14), and that the leg supporting means are connected to the chassis through a second hinge means (9, 9') constantly spaced from the first hinge means (30, 30'), the axis of rotation of said second hinge means (9, 9') being parallel to and arranged substantially in the same height as and in front of the axis of rotation (16) of the first hinge means (30, 30').

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7. A wheel chair as claimed in claim 6, characterised in that the end of the leg supporting means connected to the second hinge means (9, 9') is provided with a bend or a fold, the concave portion of which opposing the chassis.

8. A wheel chair as claimed in one or more of the preceding

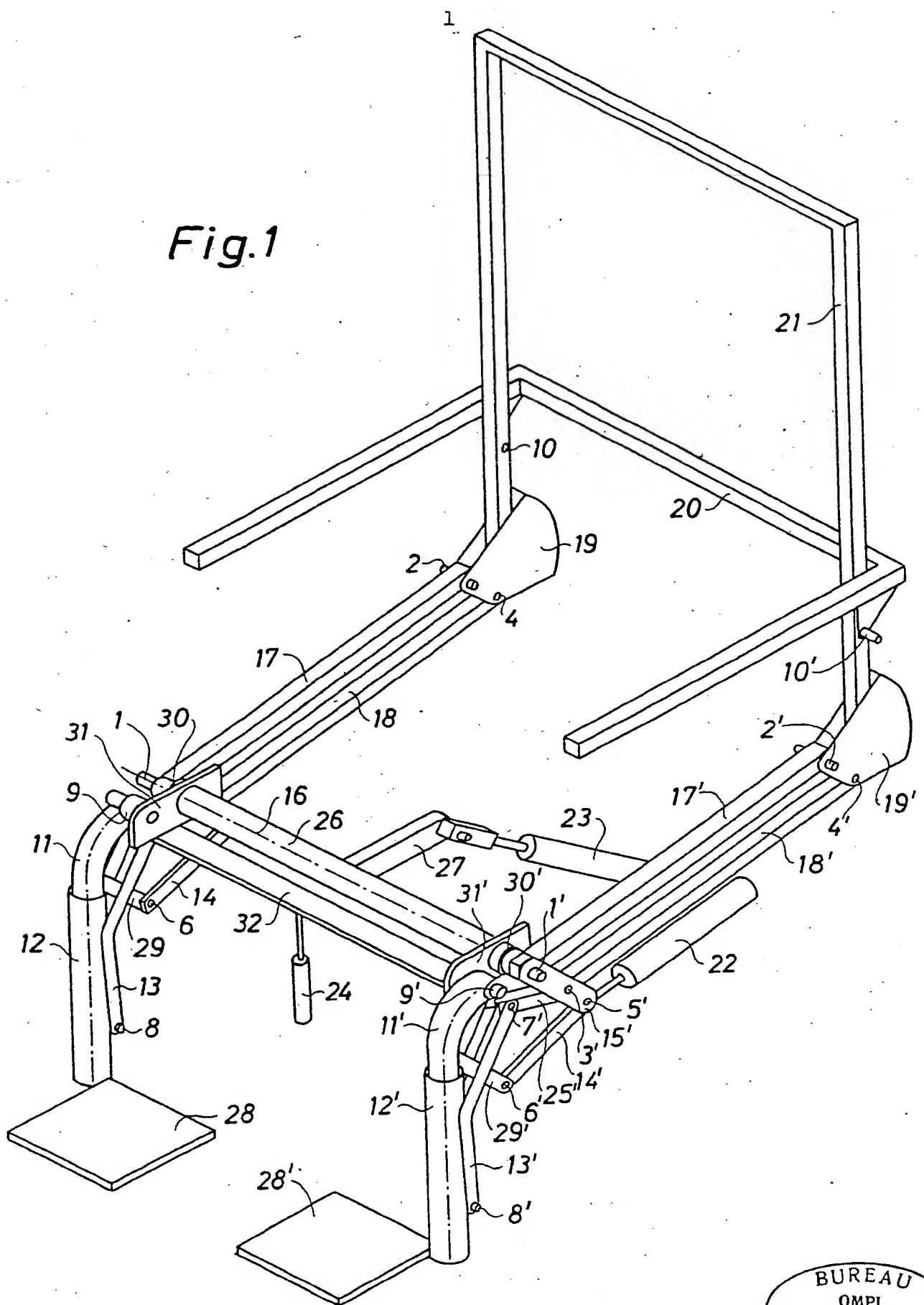
ing claims 1 to 7, characterised in that a frame portion (21) in the back is rigidly connected to the third arm (19, 19').

5 9. A wheel chair as claimed in one or more of the preceding claims 1 to 8, characterised in that the rod system is formed by two devices shaped as parallelograms and arranged along each side of the seat.

10 10. A wheel chair as claimed in one or more of the preceding claims 1 to 9, characterised in that the moving units (22, 23, 24) are hydraulic, pneumatic, mechanical or electric or combinations thereof.

15 11. A wheel chair as claimed in one or more of the preceding claims 1 to 10, characterised in that the frame portion (21) in the back is provided with pivoted arm rest means (20) capable of being arranged in the same plane as the back.

Fig.1



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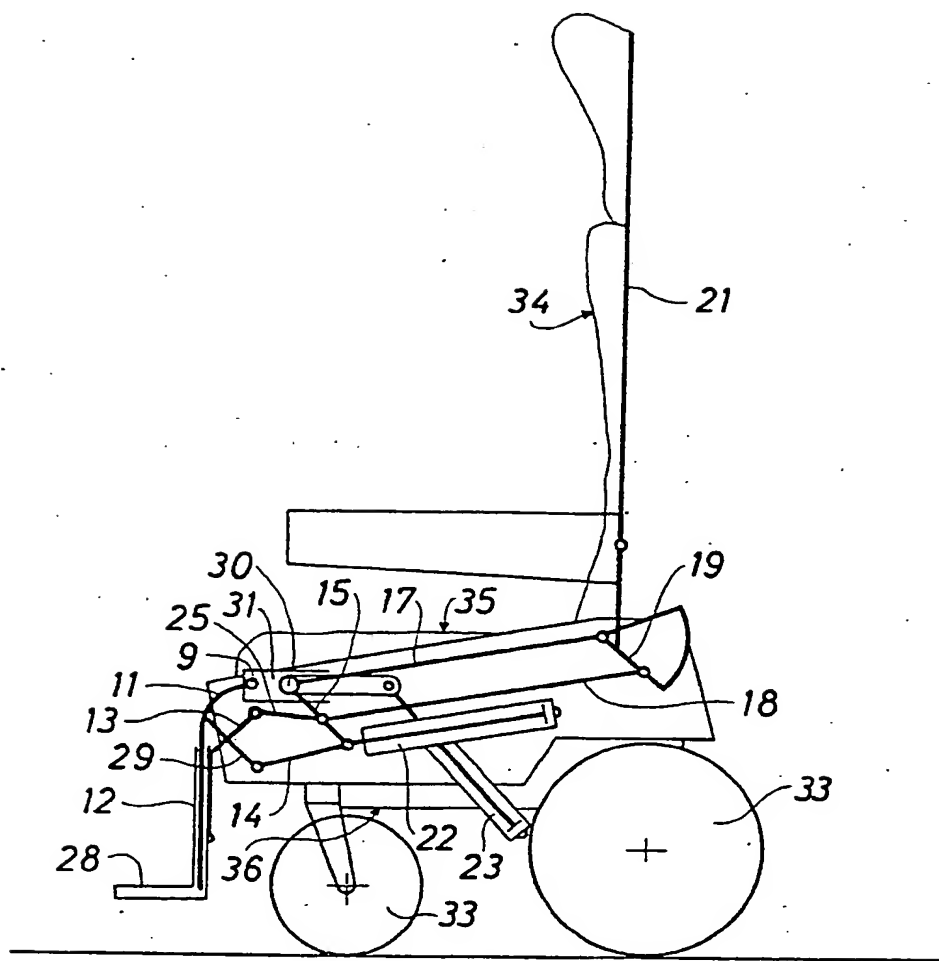


Fig. 2

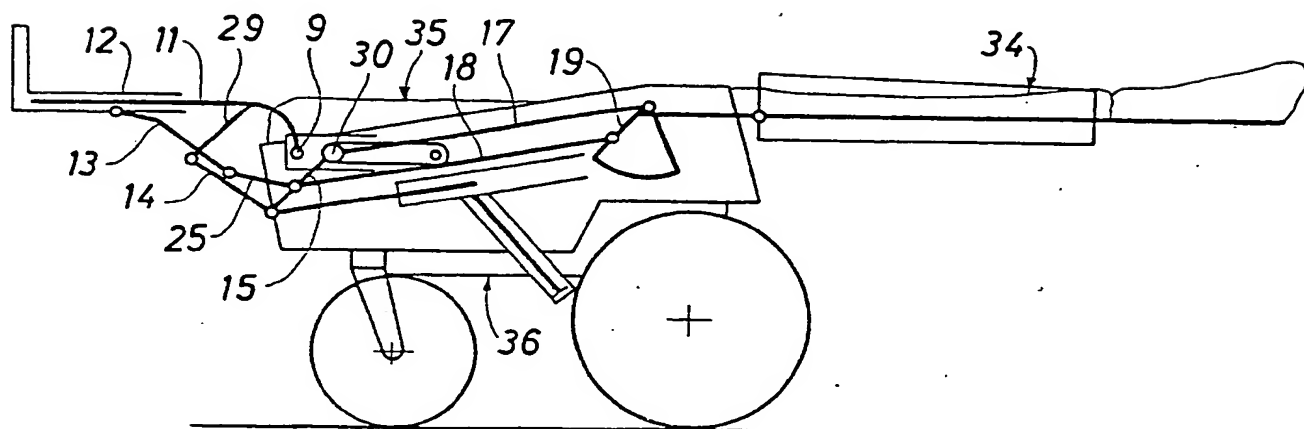
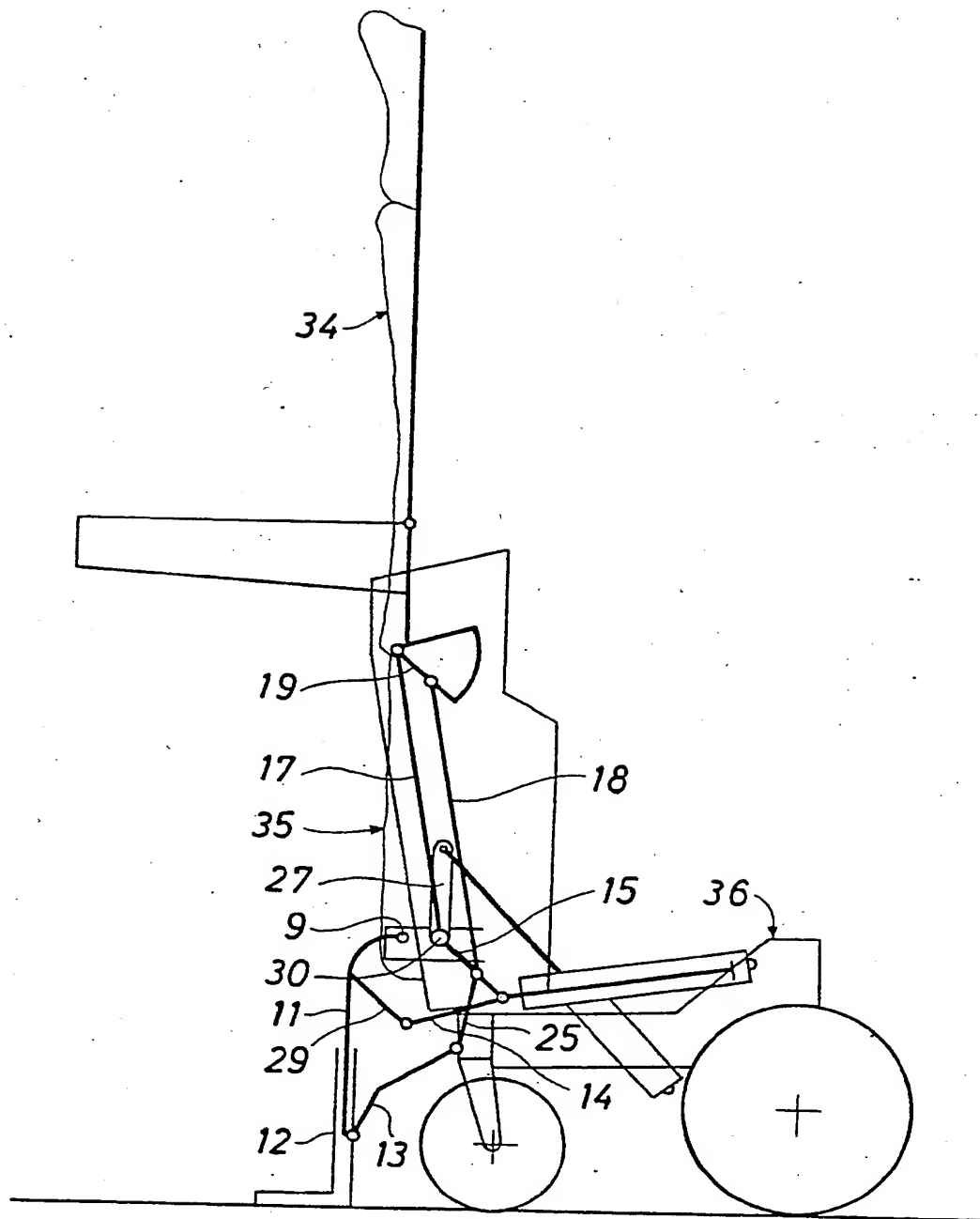



Fig. 3

*Fig. 4*

INTERNATIONAL SEARCH REPORT

International Application No PCT/DK79/00004

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) * According to International Patent Classification (IPC) or to both National Classification and IPC		
A 61 G 5/00		
II. FIELDS SEARCHED		
Minimum Documentation Searched *		
Classification System	Classification Symbols	
IPC	A 47 C 15/00, A 61 G 5/00	
US	280/30, 297/42-45, 68, 323, 330, 339, 345	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		
SE, NO, DK, FI Classes as above		
III. DOCUMENTS CONSIDERED TO BE RELEVANT **		
Category *	Citation of Document, ** with Indication, where appropriate, of the relevant passages **	Relevant to Claim No. **
X	SE, B, 300672, published 1968, May 6, AB Redey	1, 10
X	DE, A, 1951119, published 1970, May 27, Hodge Investments Pty Ltd	1, 2, 5, 8-10
X	DE, A, 2517418, published 1976, November 4 Wienand, Ernst, Czapek, Christian, Althoff, Gerd	1, 10
X	US, A, 3261031, published 1966, July 19, Gates, James T	1, 2, 3, 10
X	US, A, 3379450, published 1968, April 23, E Jones ETAL	1, 2, 9, 10
X	US, A, 3964786, published 1976, June 22, Mashuda, David	1, 10
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IV. CERTIFICATION		
Date of the Actual Completion of the International Search *	Date of Mailing of this International Search Report *	
1979-03-29	1979-04-05	
International Searching Authority *	Signature of Authorized Officer **	
Swedish Patent Office	 Nils Andersson	

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